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remedied when Connecticut and Rhode Island are added to it, as they may be in a few years; the field-work being completed for Rhode Island, and well under way for Connecticut. The water is printed in blue; the contours, in brown; the names, boundaries, railroads, and meridians and parallels, in black. The map is a handsome piece of work, but it is questionable if a finer effect could not have been produced by using a dark gray to indicate the cultural work; for the black is in too great a contrast with the rest to give satisfaction to the eye.

The larger physical features of the State are brought out with much clearness. The gradual ascent inland from the coastal lowland to the uplands can be traced quantitatively now for the first time on a map. The upland surface is, to be sure, greatly broken by valleys, but the general accordance of summit altitudes and their progressive increase westward are so well marked that they are best interpreted as remnants of an old lowland, nearly plain, — a "peneplain," as it might have been called, — now moderately elevated and inclined eastward, and much worn by subsequent valley-cutting. Very few hills rise distinctly above the surface of the old peneplain; Blue Hills near Boston, Wachusett between Worcester and Fitchburg, and Greylock in the north-western corner of the State, being the most conspicuous examples of such forms. The mountains of Berkshire are generally but little higher than the expanded surface of the plateau next eastward, and have gained their present bold relief by the wasting-away of the limestone valley floor. In the same way the trap ridge of Mount Tom and the conglomerate mass of Mount Toby stand above the floor of the deep and broad Connecticut valley that has been excavated by this ancient river in the soft triassic shales.

The contrast of form between upland and valley gives corresponding contrast in the villages built at high and low levels. Hubbardston, Petersham, and Royalston on the central plateau, east of the Connecticut valley, stand just above the contour line of 1,000 feet. Blandford, Worthington Corners, and Heath, on the western plateau, are over 1,500 feet. The hills rise little above the open country far and wide around these airy settlements, but the valleys are sunk deep below them. All the larger villages, and most of the factories of the plateau region are in the valleys; but the shoe-shops climb to high levels in Spencer and North Brookfield. The railroads follow the valleys as far as possible, and have no high bridges; this being characteristic of railroad construction on an upland so far consumed by river-work. In western Pennsylvania and New York, where the upland is more continuous and the valleys correspondingly narrower, many railroads run on the high ground, and then have to cross the river-trenches in lofty viaducts.

The wide valleys of Berkshire and the Connecticut River, opened on weak rocks, are cultivated in broad, smooth fields. The narrow transverse valleys of the adjacent plateaus, cut across the hard rocks, have steep rocky slopes and mere strips of gravelly bottom-land. The Deerfield, Westfield, Miller's and Quaboag Rivers show these features most distinctly, as any traveller on the Fitchburg or Albany Railroad may observe. The western plateau is drained in a curious fashion by streams that rise close to its western margin at heights above 2,000 feet, and traverse its entire breadth in direct or oblique courses to the Connecticut valley. Its western slope into the Berkshire valley is very abrupt. This suggests that the Berkshire limestones were not so widely exposed on the surface of the old peneplain as they are now; and that then there was no master-stream upon them, such as the Housatonic now is. If this be correct, we must picture the drainage of the old peneplain-lowland as flowing eastward from the western border of the State to the Connecticut valley, and must regard the Housatonic as a capturing stream that grew northward by head-water gnawing, after the old lowland was raised to something like its present height. The short steep ravine streams that now drain the western slope of the plateau follow inverted courses to the Housatonic; and the divides that separate them from the Connecticut tributaries must be unstable, and slowly migrating to the eastward. A walk along the margin of the plateau, past the heads of these ravine-streams, ought to detect the characteristic consequences of such migration in the form of the lateral secondary valley, that have been recently diverted from eastward to westward outlet; but the presence of

drift in this region may complicate matters so far as to render such analysis impossible.

The presence of ponds and lakes is the most perceptible consequence of glaciation. The eastern part of the State is perceptibly blued over by them, but on the higher uplands they are relatively rare.

The separate quarter-degree sheets of larger scale, about fifty of which will be required to cover the State, will receive special notice when they are completed and published. W. M. D.

#### BOOK-REVIEWS.

*Aspects of the Earth: A Popular Account of Some Familiar Geological Phenomena.* By N. S. SHALER. New York, Scribner. 8°. \$4.

THIS is a superb reproduction in book form of the excellent papers by Professor Shaler, that recently appeared in *Scribner's Magazine*. There are sixteen full-page illustrations, besides nearly a hundred in the text, the most of them copies of photographs in the finest and most faithful style of wood-engraving. These transcripts from nature the author believes to be more helpful to the general reader than diagrams that require a schooled eye to apprehend.

The topics of the chapters are "The Stability of the Earth," "Volcanoes," "Caverns and Cavern Life," "Rivers and Valleys," "The Instability of the Atmosphere," "Forests of North America," and "The Origin and Nature of Soils." It is a good selection of themes that at once possess a scientific interest and a popular and practical bearing; all, in fact, relating to the surface of the earth or to phenomena more or less familiar to the public. The author has made it his special purpose, in his own words, to choose subjects that "commend themselves to the attention of intelligent people," and "show the relation of natural forces to the fortunes of man."

The first chapter offers a satisfactory explanation in general of earthquakes, though not emphasizing and illustrating the effect of cumulative tension in the earth's crust, which might be compared to that which is indicated by the cracking sounds of a stove-pipe under the expansion of heat, or of a house under the contraction of extreme cold. There is a full treatment of the facts in regard to earthquake regions in the United States, especially as connected with undisturbed pinnacles of rock and poised boulders as indices of long periods of rest. These may be admitted as proofs of the absence of great earthquakes, but are hardly to be regarded otherwise, inasmuch as a pinnacle, a wedged boulder, or a "rocking stone" might endure a good deal of oscillation.

Volcanoes are referred to the superheating of water everywhere permeating the crust to the amount of twenty per cent or more, — a simple solution that is a relief to one's mind after all the theories about descending sea-water, lakes of fire, and what not. Caverns and cavern life, rivers and valleys, are treated with the freshness of statement and illustration that characterize the entire volume; and while a theoretic item still under discussion is sometimes assumed as fact, there is, for example, a candid remark that cave-life exhibits modifications that cannot be caused by the competitive struggle of existence, — an impartial remark in the noble spirit of Darwin himself. The natural bridges, as that of Virginia, are explained as remains of caverns. The cañons of the West are well accounted for, and the cutting of rivers across mountains, also, but in a way that would have been helped by the very apt illustration (in a United States geological report) of a saw-log slowly rising against a horizontal saw.

The advocates of forest conservation have an ally in Professor Shaler, who clearly sets forth the evils of denudation. It would appear, however, that the destructive process goes on mostly in wild districts, and that long settlement of a district tends to restore, and even to create groves where they were not. This last tendency is strikingly manifest on the prairies in a few years after occupation, and a manifestly changed climate follows. The loss of a rich top-soil by washing, after the plough has broken up the original protecting turf, is an evil that needs more attention. Is it not possible to check this in a measure by so running the furrows that these shall not be channels of waste, and to further avoid this

result by back-ploughing every alternate furrow, making it a dam. Surely the practice, recommended by some, of subdividing the rainfall by furrows running up and down a slope, must be more wasteful in the final result than an occasional rushing break of the water retained by the process above described.

Cyclones and tornadoes are amply discussed in the light of the latest investigations. A diagram of equatorial and polar currents would aid such readers as are not familiar with the general theory of winds; and there seems to be in this book an over-valuation of winds in the production of the great ocean-currents. In regard to tornadoes, observation would teach that the author's advice to construct houses of brick or stone in tornado regions is not wise. A massive stone building is torn to pieces as easily as one of wood, and with far more danger to the occupant. In fact, the stone foundations of a house are sometimes swept clean off, level with the ground. In the path of the tornado there is but one security, — an outside underground refuge with most direct access from the living-rooms of the house, such as by a trap-door and stairs, if the ordinary cellar stairway is not near the south-west corner. The roar of the storm may readily be mistaken for that of cars. The funnel of the cloud may follow at some interval the accompanying general storm, when one least expects devastation. There may not be a moment to lose in going to an out-of-doors tornado-refuge, which some have recommended. And there should be not only ingress from the cellar, but some mode of egress from the cave in case the cellar entrance is blocked by *débris*, and especially in case the wrecked house takes fire. Certainly, in exposed regions, fifteen dollars spent in rightly providing a refuge is worth the peace of mind it brings, though the terrible disaster never comes.

The concluding chapter on soils is of interest to every intelligent reader as well as to cultivators of the ground. Happily, it must have come into many rural homes in its first form as a magazine article. Of course, the great expense of this volume is its engravings, such a full-page picture as that of the Yellowstone Falls probably costing two hundred dollars. But, many of the woodcuts having already paid something like their cost in the magazine, it is to be regretted that a cheaper edition on less costly paper is not issued along with this luxurious one; lighter, too, for the very heavy paper in a book of this size is a considerable weight to hold, in this instance three and a half pounds. Large type and very thick paper are suitable in books of a pictorial sort for brief entertainment rather than continuous reading.

"*Evolution of Sound*" *Evolved*. By M. J. THOMPSON. Cincinnati, Standard Publishing Co. 8°.

THERE once lived in this town (by "this town" we mean New York) a certain Dr. Hall, who was much given to violent attacks on all that had been considered as reasonable by ordinary mortals in the results of the investigations of scientific men. It may be that some of our readers will remember the doctor's attack on the wave-theory of sound, and his vehement appeals to scientific men to answer his arguments against the validity of the conception we now have of the way in which sound is propagated. It cannot be said that opportunity for discussion was lacking, for the warlike doctor even went so far as to establish a journal — *The Scientific Arena* — for the very purpose of furnishing a suitable medium for open discussion of the merits of his arguments. But all this was to little purpose till the author of "'Evolution of Sound' evolved," at that time professor of science in Garfield University, Wichita, Kan., published a number of letters, pointing out how the doctor had wandered a little from the paths of wisdom. These have been collected in book form; and, even if they did not serve the purpose of opening the eyes or ears of Dr. Hall, it may happen that there will be others who will find in them answers to attractive sophistry or to their own doubts.

Appended to these letters is reprinted Professor Thompson's graduation thesis at Ann Arbor, on the measurement of chemical affinity.

*Mountaineering in Colorado: the Peaks about Estes Peak*. By FREDERICK H. CHAPIN. Boston, Appalachian Mountain Club. 12°.

THE Appalachian Mountain Club is made up of those men and women, boys and girls, who, for the most part living not far from

Boston, delight in taking walks. The most of their excursions are, per force of circumstances, taken through the most attractive regions to be found near their homes. But every year one or more parties start for a tramp through the White Mountains, a winter tramp in that region being a yearly feature of the club's doings. All this leads to an increase in the intelligent interest in the hills and mountains visited, and is very pleasant as a recreation for those able to take part.

The volume now before us shows that one member has had the temerity to venture thousands of miles from the usual haunts of his colleagues. We have in it a record of his wanderings through unfrequented valleys, and even those hitherto unvisited by white men, of his clamberings over peaks, and of the views he saw. Fortunately our author was an admirable photographer, and fortunately again his negatives fell into the hands of good engravers, as we are enabled, by the excellent and numerous pictures with which the volume is embellished, to gain some idea of what was spread before his eyes.

The book is well written, contains a good deal of information such as is told in the narratives of travellers, and is a real contribution to our knowledge of one of the few out-of-the-way and yet wild corners of our country.

*The Graphic System of Object Drawing*. By HOBART B. JACOBS AND AUGUSTA L. BROWER. New York, A. Lovell & Co. 75 cents.

THE aim of the authors of this admirable series of drawing-books is to give the pupil a clear idea of form, to help him to express that idea on paper, and to give him command of his pencil, so that he can draw the objects about him. The plan of the work is so simple that any teacher can use it; and a manual for the teacher's use, which accompanies the set of drawing-books, makes the system plain even to those entirely unskilled in the art. The course is intended to cover four years of practice, and is adapted for use in both public and private schools. The part of the series intended for the primary course deals only with single objects in outline; the part for the intermediate course is devoted to drawing from groups of objects; in the part prepared for the grammar department, studies in tones and values are given; and for the high school, thorough instruction in drawing from life is found. Manuals for the four departments, or four-years' courses, are provided.

While the methods for work given in this series are based on the systems current in many of the best schools of art, and on the practice of the most successful art teachers, no attempt is made to attain the critical accuracy to be expected in more advanced textbooks. The authors claim for it simply an original and highly efficient arrangement of lessons; and no one who carefully examines the system will deny that it is one which will naturally call forth the interest and develop the powers of the pupil.

#### AMONG THE PUBLISHERS.

A HISTORY of American literature, by Karl Knortz of this city, will be published shortly in Berlin by Hans Lüstenöder.

— John P. Morton & Co., Louisville, Ky., have in preparation a work on "Kentucky Jurisprudence," by Lewis N. Dembitz of the Louisville bar.

— The American Writing Machine Company, Hartford, Conn., has issued a pamphlet showing a selection of writing-papers suitable for use on the Caligraph.

— "Odds and Ends from a Literary Junk Shop" is the title of a priced catalogue of new and second-hand books just issued by A. S. Clark, 34 Park Row, this city. It contains many points of interest to book-buyers.

— Thoroughly earnest work is being done in behalf of tariff reform by the New York *Weekly Post*, which holds that the time to discuss this economic question is now rather than in the heat of a presidential campaign. Every issue of the paper contains articles bearing upon some phase of the subject, together with questions by doubting readers, with answers by the editor, all tending to facilitate and simplify the discussion. The *Post* is compiling a di-